

VERIFICATION OF COLD-WAVE SIGNALS FOR OCTOBER, 1891.
Cold-wave signals.—(Ordered by Prof. H. A. Hazen.)—

Twenty cold-wave signals were ordered during October, 1891, 8 of which were justified. Percentage of justifications, 40.

INLAND NAVIGATION.

ICE IN RIVERS AND HARBORS.

Hudson River.—The first ice of the season formed at Albany, N. Y., on the 30th.

Detroit River.—Large quantities of floating ice were reported at Detroit on the 30th.

Grand River.—The river was frozen at Lansing, Mich., on the 29th.

Black River.—At Port Huron, Mich., thin floating ice was reported on the 19th; floating ice on the 28th; on the 29th the river was covered with very thin ice; floating ice on the 30th.

Fox River.—Ice 7 inches in thickness was reported at Appleton, Wis., on the 30th.

Wisconsin River.—The river was frozen on the 18th.

Manitowoc River.—At Manitowoc, Wis., the river was closed on the 18th; it was open on the 21st, and again closed on the 25th.

Red River of the North.—At Saint Vincent, Minn., persons were crossing the river on the ice on the 17th, and on the 19th teams were crossing.

Mississippi River.—At Saint Paul, Minn., the river was gorged with ice and frozen from the Robert street bridge as far up as could be seen on the 19th; below the bridge the river was open. On the 27th the river was gorged with ice, except at the foot of Jackson street. At Red Wing, Minn., the first ice of the season appeared on the 17th; on the 18th the river was frozen over, and the ferry boats had stopped running; on the 20th the ice was broken up and ferry boats resumed their trips; on the 24th the river was frozen during the night, but the ice was broken by the current and high wind; on the 25th the river was again frozen over. At La Crosse, Wis., floating ice was reported on the 17th; on the 18th the river was gorged with ice above the town; on the 21st the river in front of town was clear of ice; on the 27th the river was closed by ice. At Dubuque, Iowa, the river was full of ice above the bridge on the 24th; on the 28th the river was frozen over. At Le Claire, Iowa, the river was frozen on the 18th; on the 21st the ice was breaking up; the morning of the 25th the river was frozen, but the ice broke up in the afternoon; on the 29th the river was frozen. At Davenport, Iowa, the river was frozen on both shores and was full of floating ice on the 17th; river full of floating ice on the 18th and 20th; continued full of floating ice until the 29th, when it froze over, and on the 30th persons were crossing on the ice. The river was frozen at Muscatine, Iowa, on the 16th. Floating ice was reported at Warsaw, Ill., on the 29th, and at Alton, Ill., on the 30th.

Illinois River.—At Ottawa, Ill., the river was frozen on the 19th; on the 20th the ice ran out, and on the 28th the river was frozen.

Missouri River.—At Fort Buford, N. Dak., the river was frozen on the 14th. At Pierre, S. Dak., ice was running in the river, with solid shore ice, at 1 a. m., 12th, and at 9 a. m. the shore ice was strong enough to bear the weight of a man, and traffic was suspended above the pontoon bridge; on the 13th ice was running in the river, the shore ice was extending, and the pontoon bridge was closed to traffic; on the 14th ice was running, and an ice gorge had formed north of the end of the pontoon bridge; on the 15th the east side of the channel was frozen over, and ferry boats were tied up for the season; on the 24th persons were crossing on the ice above the pontoon bridge. At Sioux City, Iowa, ice was running in large quantities from the 13th to 15th, and on the 25th the river was frozen over, closing navigation. At Saint Joseph, Mo., ice was running in the river on the 17th; on the 18th the river was blocked with ice; on the 28th it was clear of ice; and on the 30th running ice was noted. At Leavenworth,

Kans., the river was full of floating ice on the 17th, and the ice was sufficiently heavy to break the pontoon bridge; the river was full of floating ice on the 18th and 19th.

On the 30th ice in the canals of New York interfered with navigation. A report from Albany, N. Y., stated that all canals, except the Erie, were to be closed for the season at midnight.

CLOSING OF NAVIGATION.

Navigation closed at Green Bay, Wis., on the 30th. Navigation closed on the Fox River, Wis., on the 25th. Navigation closed on the Mississippi River at Dubuque, Iowa, on the 15th. Navigation closed on the Missouri River at Sioux City, Iowa, on the 25th.

LOW WATER.

Navigation on the Ohio River, which had been suspended on account of low water between Pittsburg, Pa., and Cincinnati, Ohio, from September 14th, and between Pittsburg, Pa., and Wheeling, W. Va., from September 24th, was resumed on the 23d. A report of the 18th stated that the Red River was exceptionally low at Shreveport, La., and that boats were unable to run. The Detroit and Saint Clair rivers were very low on the 17th. At Chattanooga, Tenn., the Tennessee River rose after the 14th, and boats resumed their trips by the 25th.

FLOODS.

Heavy rain during the first decade of the month caused destructive floods in the streams of northwestern Washington. Railroads were washed out, telegraphic communication was interrupted, and bridges were carried away.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, November, 1891 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River.</i>						
Shreveport, La.	29.9	1	—0.7	15-17, 19, 20	—1.7	1.0
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	13	3.7	8, 9	1.0	2.7
Little Rock, Ark.	23.0	24	7.2	11, 12, 13	2.7	4.5
<i>Missouri River.</i>						
Fort Buford, N. Dak.						
Sioux City, Iowa						
Kansas City, Mo.	21.0	2	6.4	24, 25	3.7	2.7
<i>Mississippi River.</i>						
Saint Paul, Minn.	14.0	1	1.3	18	0.1	1.2
La Crosse, Wis.	11.8	21, 22	2.2	10-17	0.5	1.7
Dubuque, Iowa	16.0	1, 2, 8, 9	1.9	26	1.1	0.8
Davenport, Iowa	15.0	1	1.1	28	—0.2	1.3
Keokuk, Iowa	14.0	1	0.7	29	—1.2	1.9
Saint Louis, Mo.	30.0	25	5.9	30	4.0	1.9
Cairo, Ill.	40.0	30	15.0	6, 7	2.4	12.6
Memphis, Tenn.	33.0	30	8.3	8, 9	1.0	7.3
Vicksburg, Miss.	41.0	30	3.9	16, 17, 18	—2.5	6.4
New Orleans, La.	13.0	9	3.9	15, 16	2.2	1.7
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	26, 27	14.6	10, 11	2.7	11.9
Cincinnati, Ohio	45.0	29	24.6	2	4.5	20.1
Louisville, Ky.	24.0	30	10.3	1, 2, 3	3.0	7.3
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	23	11.3	2-9	0.0	11.3
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	26	6.7	4-10	1.2	5.5
<i>Monongahela River.</i>						
Pittsburg, Pa.	29.0	25	13.0	7	5.7	7.3
<i>Savannah River.</i>						
Augusta, Ga.	32.0	25	15.8	2, 8	5.5	10.3
<i>Willamette River.</i>						
Portland, Oregon	15.0	5	5.3	1, 2	2.8	2.5
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	26	6.5	9, 10, 11	2.0	4.5
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	30	3.5	1-8	—0.3	3.8

* Record incomplete. † For 24 days.